AN

ACCOUNT
OF THE
FISH-POOL:

Conſiſting of

A DESCRIPTION of the VESSEL ſo call'd, lately invented and built for the Importation of Fiſh alive, and in good Health, from Parts however diſtant.

A PROOF of the Imperfection of the *Well-Boat* hitherto uſed in the FISHING TRADE.

The true REASONS why Ships become ſtiff or crank in Sailing; with other Improvements, very uſeful to all Perſons concern'd in Trade and Navigation.

Likewiſe,

A DESCRIPTION of the Carriage intended for the Conveyance of Fiſh by Land, in the ſame good Condition as in the *Fiſh-Pool* by Sea.

By Sir *RICHARD STEELE*, and
Mr. *JOSEPH GILLMORE*, Mathematician.

LONDON:
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To the Honourable

Sir *John Ward*, Kt.

Lord Mayor of LONDON.

My LORD,

AS I think it manifeſt that the Deſign, explain'd in the following Account, will introduce a new and profitable Courſe of Trade; I preſume to addreſs this Narration to the Greateſt Magiſtrate of the Greateſt Commercial City.

Your perſonal eminent Qualities, as a good Citizen, and Man of Buſineſs, which I have frequently heard you exert, where you, with great Ability, repreſent the ſame City in another honourable Character, entitle you alſo to the Veneration and Eſteem which determine me in my preſent Application.

The Arts and Sciences (in which I pretend to no accurate Skill) ſhould always be employ'd in Enquiries that may tend to the general Advantage; and they muſt loſe the Name of Liberal, when the Profeſſors of them ſeclude themſelves from Society; or live in it, without applying their Abilities to the Service of it. For it is by the joint Force of Men of different Talents, that uſeful Purpoſes are beſt accompliſh'd; and a certain Felicity of Invention in one, join'd to the Experience and practical Skill of another, may bring Works to Perfection, which would be ſo far from Growth, that they would not ſo much as have had Birth, but from the good Intelligence between Perſons of unlike Abilities; whoſe Good Will towards each other united their Endeavours.

I dare promiſe your Lordſhip, that the Correſpondence between the Undertakers of this Deſign, will produce to the World many other Operations, which will create more Wonder, that they were not perform'd before, than that they are now brought into Uſe. For it is certain, that great and worthy Works are every Day loſt, by the Diſtance which is kept between Men, from the very Reaſon which ſhould make them ſeek each other in their different Way of Life and Education.

Among the Employments of human Life, that of the Merchant (whoſe Good is the Good of all Men) ſhould by all be held in the firſt Eſteem: It is he, who enlarges the Intereſts of his Country; it is he, who, by his Credit, makes his Fellow-Citizen every where at Home, and extends the Offices, Advantages, and Civilities of Acquaintance and Neighbourhood, to all Parts of the habitable World.

The following Invention is propos'd to be carry'd on with a ſuperior Regard to the Laws and Rights of Commerce, which oblige every Man to think of himſelf but in the ſecond Place, or to make his firſt Intentions, at leaſt, ſtrictly agreeable to the Good of his Country, and that of all his Fellow-Citizens; and therefore, the Account of it may be a Preſent not unworthy a Gentleman of your free and diſintereſted Character; and I flatter myſelf it will have the Influence of your Lordſhip in the Proſecution of it. I need not ſay how great that Influence muſt needs be, where you act for them in the greateſt Capacities your Fellow-Citizens have to beſtow.

I congratulate both them and you, that a Perſon of ſuch known Æquanimity

nimity is veſted with the double Capacity of aſſerting and protecting their Privileges; whoſe Candour and Benignity naturally tend to abate Animoſity, encourage Induſtry, promote Peace, prevent Diſorder, ſecure Wealth, and relieve Poverty: In all which noble Ends and Cares I wiſh you a proſperous and memorable Mayoralty; and again humbly deſiring, that if this Deſign ſhall in the leaſt Degree appear ſerviceable in any of theſe generous Reſpects, it may have your Protection,

I remain,

My LORD,

Your Lordſhip's moſt obedient

And moſt humble Servant,

Richard Steele.

THE

FISH-POOL, &c.

THERE has much Calumny been utter'd, and many impertinent Obſervations made upon one of the Undertakers of this Work which I am now going to deſcribe; but as he formerly declar'd in Print, that while he was purſuing what he believ'd might conduce to the common Good, he gave the Syllables *Richard Steele* to the Publick, to be uſed and treated as they ſhould think fit, he muſt go on in the ſame Indifference, and allow the Town their uſual Liberty with his Name, which

I find they think they have much more Room to ſport with than formerly, as it is lengthen'd with the Monoſyllable *Sir.*

But tho' I am not ſolicitous for what they ſay of Sir *Richard Steele*, merely as it regards the Matter of his Fame or Reputation, which is too large to be unexceptionably good or bad, but muſt neceſſarily ſhare the Fate which attends Men of undertaking Complexions, who are the Entertainment and Diſcourſe of idle People, that inſenſibly, for Want of other Employment, hate the Perſons of thoſe they never ſaw, and oppoſe Deſigns into which they never examine. I ſay, let one of the Undertakers be conſiderable or inconſiderable, according to the Temper of the Company wherein he is mention'd, I cannot let a Great and Good Work, which may be a Benefit to all the World, be loſt and run down, becauſe, perhaps, his Part in it may have been only a mere Suggeſtion, or a lucky Start, that owes its Progreſs to the being communicated to a more capable Man, that ripen'd it into Practice, and qualify'd it for the Service of Society.

If this were the Caſe, as I know it is, and that with great Inconvenience to himſelf, any Man, from a reſtleſs good Spirit, has attempted (not to ſay accompliſh'd) a moſt extraordinary Work, for the Advantage of the whole Species, eſpecially the poorer Sort, all Men are oblig'd, in Juſtice and Gratitude, at leaſt to give the Matter a fair Hearing.

The Reader is deſir'd, on this Foundation only, as it regards himſelf and all other Men, as well as the Undertakers, to approve or condemn the Deſign of the Fish-Pool, and to hear the Relation of the ſeveral Steps and Degrees by which it was brought to its preſent Perfection.

It is now about five Years ſince Sir *Richard Steele*, upon ſeeing certain Experiments of an Air-Pump, conſulted a Gentleman of known Experience and Ability, concerning a Deſign to form a Veſſel which ſhould preſerve dead Fiſh from Corruption a longer Time than uſual; but the Gentleman ſo conſulted, convinc'd him of the Impoſſibility of performing that Matter in the Manner he ſuppos'd it practicable, and diſcourag'd him from farther Enquiry that Way.

But the Matter did not end there; that Diſappointment only gave his Thoughts another Caſt; and much Reflection on that Subject ended in an Imagination, that tho' dead Fiſh could not be preſerv'd from Putrefaction by what he had ſuggeſted, live Fiſh might, by new Methods, be convey'd better than they had been by the

Means already practis'd, which would end in the ſame Advantage.

About this Time Mr. *Steele* had the good Fortune to become acquainted with Mr. *Gillmore*; and falling by Degrees into great Familiarity, frequently hinted to him, that he could not but think it practicable, that a Veſſel might be contriv'd ſo as to bring Fiſh alive much better than at preſent; and took frequent Occaſions to ſolicit him, whom he knew very well ſkill'd in Navigation and other Parts of the Mathematicks, to turn his Thoughts on that Subject. Mr. *Gillmore* could not be brought to apply himſelf to this Propoſal, 'till about a Twelvemonth ago he was urg'd, by a Letter from Sir *Richard Steele*, to comply with his former Requeſt, now he (Mr. *Gillmore*) was at Leiſure, at his Place of Abode at *Nettleton* in *Wiltſhire*.

The Thing that dwelt upon the Imagination of the Inventor was, That ſince it was notorious, that Ships, without ſinking, frequently admitted many Tuns of Water, beſides their proper Lading; a Veſſel, by a good Artiſt, who knew the Reaſon, Nature, Philoſophy, Principles, and Laws of Mechaniſm, might be contriv'd to carry no Lading but Water and Fiſh, whereby Fiſh might live commodiouſly, and ſuch Water be admitted, and made to paſs thro' at Will, and nevertheleſs the Ship to ſail with Safety.

Mr. *Gillmore* began now to liſten, and return'd for Anſwer, he would immediately take the Matter into Conſideration, and in a few Days after, ſent his Friend the Projection from which the FISH-POOL was modell'd, and built 16 Inches by the Keel; which 16 Inches was divided into 40 equal Parts, and made into a Scale call'd Feet, and by it projected the FISH-POOL, 40 Foot by the Keel, 16 Foot broad in the Midſhips, and 6 Foot deep between the Kelſon and Deck on which ſhe ſwims; with Grates 'fore and aft', Air-Pipes, Well into the Hold through both Decks, Maſts, Yards, Rigging, and Hatchway to go down between-Decks, and other Conveniencies, all in Proportion.

From this Model, by a leſſer Scale, was made an Hull of very ſmall Dimenſions, as 10 Inches by the Keel, 5 Inches broad in the Midſhip, 2 Inches and a Quarter deep in the Hold, with a proportionable Well, and a little Glaſs Deck, on which it was to ſwim.

We carry'd our Veſſel over Land to a Place near the Village of *Hackney*, call'd *Temple-Mills*, which is the Spot that divides *Middleſex* from *Eſſex*, near an Iſland which we nam'd, from its Bigneſs, *Treſacre* Iſland.

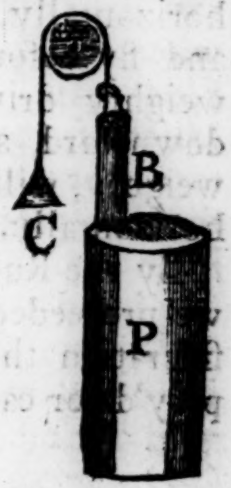
After we had put into our Veſſel a *Flounder* and ſix *Gudgeons*, (on which latter Word we allow all *Small Wits* to make merry) we plac'd her in the Current of the ſecond Trough of a Logwood Mill, and moor'd her very ſafely, where, from Hour to Hour we viſited her, and thro' her Glaſs Deck ſaw her Paſſengers very merry, which made us not a whit leſs contented. After we had remain'd in the Houſe adjacent as long as we thought convenient, we left a young Man to attend the Veſſel, and keep a Journal of what paſs'd, as to the Conſumption of the Food of the Fiſh, and the like.

The Ignorant are naturally malicious to any Thing they ſee out of the common Road, and we found the Weight of it in our firſt Eſſay; for a Servant of the Mill, tho' deſir'd and brib'd to give Warning, when he ſhould have Occaſion to raiſe the Flood-gate, imagining he was able to do Miſchief, open'd it upon our Veſſel, which tore her from her Moorings; but ſhe, tho' her proper Lading is but about one Pound, rid the Storm; and our truſty Pilate jump'd into the River, and took her up, where ſhe was driven on the North of the Iſland of *Treſacre*, without having receiv'd the leaſt Damage in her Hull or Cargo, from a greater Storm and Streſs of Weather than any Ship can poſſibly meet with at Sea.

Tho' this appear'd very ſatisfactory, Mr. *Gillmore* comply'd with his Partner, to give him more than Ocular Demonſtration, by going thro' the proper Experiments, which ſhould make him as clearly underſtand the Cauſes, as he ſaw the Effects; without which, it was impoſſible to enjoy Quiet under ſo great an Expence, as the Building a Veſſel for Uſe muſt neceſſarily require.

For this End we reſolv'd to go from one Circumſtance to another, and conſider the Nature of the Elements and Parts of Matter with which we were to deal, and from thence form Concluſions that might make us eaſy and confident in our future Proceedings.

The firſt Experiment was thus; we exhauſted the Air out of a Cylinder 12 Inches diameter, and 2 Foot deep, as P, whoſe Superficies on the Top is 113.1428, by an Air-Pump, as B, being 1 Inch diameter, whoſe Superficies on the Top is .78571, and found the Weight C to be 12 Pounds 9 Ounces; then, if the Superficies on the Top of the Air-Pump be .78571, and the Weight of the Atmoſphere preſſing on the Air-Pump 12.57 Pounds, the

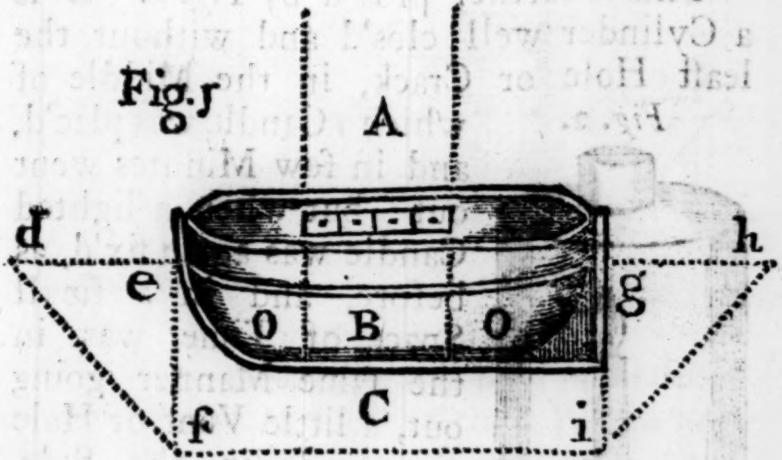


Weight of Air on the Cylinder B, at a Foot diameter, will be 1810.2848 Pounds: So, by Conſequence, on every Inch ſquare is 16 Pounds in the Summer; and every Foot ſquare, or 144 Inches, the Weight preſſing on it is 2304 Pounds, or 20 hundred 2 Quarters and 8 Pounds *Averdupois.* From which Experiment, and the Reflection that the Parts of Water are globular, we concluded, that the Air being preſs'd into the Water by the Weight of the Atmoſphere, is thereby convey'd to all living Creatures under Water; and that if this Air is not put in Motion, it muſt ſoon corrupt; for, a Breeze is no more than a Body of Air broken, or forc'd by ſomething more ſolid than itſelf: Note alſo, that Water is impell'd by the ſame Means; for, force Air or Water horizontally, like Springs, they will yield and fly before you while nothing more weighty drives back; but force them downward, and the Earth, by being more weighty, will reſiſt it, and make it ſpread horizontally.

By the Rule of this Philoſophy, before we proceeded farther, we took into Conſideration the only Engine hitherto employ'd for carrying Fiſh alive, to wit,

The WELL-BOAT.

Fig. 1



Since all that has been hitherto attempted of this Kind, has been by a *Well-Boat*; and that it is known, that from the Moment Fiſh are put into that Vehicle, they ſicken, foam, and froth at the Mouth, fall into Convulſions, and in a ſmall Time die; it behov'd us to examine the Reaſon of this, and found that it cannot happen otherwiſe, as appears from *Fig.* 1, which ſhows, that they cannot receive in that Machine what are abſolutely neceſſary to their Being, *viz.* freſh Air and freſh Water; becauſe the Pillar of Air A, preſſes down upon the *Well-Boat* B, which *Well-Boat* is ſupported by Pillar of Water C, and ſurrounded by the like Trapezium of

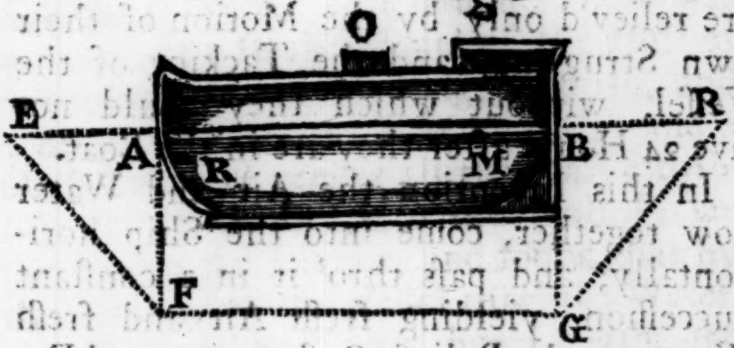
Water d e f g h i, by which Means, and the Bulk-heads O O, all freſh Air and Water are excluded.

This is farther prov'd by *Fig.* 2. L is a Cylinder well clos'd and without the leaſt Hole or Crack, in the Middle of which a Candle was plac'd, and in few Minutes went out; but when a lighted Candle was again fix'd, as before, and in a ſmall Space of Time was in the ſame Manner going out, a little Vent or Hole was made in the Side, on which it reviv'd; and will ſtill do ſo more, in Proportion to the Greatneſs of the Hole; by which we concluded, that the Cylinder being full of Air, and preſſed by the Pillar above it, the Flame of the Candle could not ſubſiſt; but when the Pillar of Air was broken in the Cylinder, by means of the Vent-Hole, we apprehended the Matter of the Candle to be put (or rather continu'd) in Motion, and therefore it reviv'd: From either of which Circumſtances, the Confinement of only a certain Quantity of Water in a *Well-Boat*, or Air in any ſuch Veſſel, equally appears.

Fig. 2.

Now, that the Fiſh in this new-invented Veſſel are conſtantly ſupply'd with freſh Air and freſh Water will appear from *Fig.* 3.

Fig 3



It is to be underſtood that this Veſſel is to have no other Lading than Water and Fiſh; *i. e.* this Veſſel is to carry as much Weight of Water and Fiſh, as another would of dry Goods, to make her ſink low enough down into the Water, ſo as to be fit for ſailing; and that the Fiſh and Water are to fill all the Hold of the Veſſel.

A B is the lower Deck, on which ſhe ſwims; ſhe is ſupported by the Pillar of Water A B F G; and encompaſs'd all round by the Trapezium of Water E R G F preſſing againſt it.

Hitherto the *new Veſſel* is but in the Condition of all other Boats, and even of the *Well-Boat* itſelf.

But whereas the Imperfection of the *Well-Boat* conſiſts, in that the Water and Air are conſtantly the ſame, and conſtrain'd to be ſuch by a perpendicular Weight of both, and an horizontal Preſſure on all Sides; from which the Fiſh are reliev'd only by the Motion of their own Strugling, and the Tacking of the Veſſel, without which they could not live 24 Hours after they are in the Boat.

In this Invention the Air and Water flow together, come into the Ship horizontally, and paſs thro' it in a conſtant Succeſſion, yielding freſh Air and freſh Water, to the Relief, Suſtenance, and Delight of the Fiſh; which great Advantage is effected by large Grates at the Head and Stern, or each End of the Veſſel, at P and M, and by the Vents which open into 4 large Pipes before, and 2 abaft, and in the Midſhips, the Well is cover'd with Gratings, as O. There are alſo other Conveniences, to-wit, the Main-maſt, and Sluice-pipe, all which yield a free Diſcharge, and form an uninterrupted Paſſage for the Air.

After the Projectors were ſatisfy'd of the Uſe and Benefit of the Air and Water, in which they were to work, as far as it concern'd their Deſign, the next Thing was to conſider how their intended Veſſel would receive Advantage from them in its ſailing and working; which brought on the third Experiment, that is demonſtrated by *Fig.* A. which ſhews the Form of a Parallelopepidon, 12 Foot long, 9 Inches broad, and 6 Inches deep, as a b c d: This Trough was fill'd with fine clear Water, which done, there was put into it a ſmall Model of the Hull of our Sloop, 12 Inches long, 4 broad, and 3 deep, with Grates 'fore and aft', and a Glaſs Deck, to render all that paſs'd thro' her viſible, as B. Into the Well P, we put a deep red Liquor, and found that by the Motion of the Veſſel thro' the Water, the Diſtance 20 Times her Length, ſhe would diſcharge all her ſaid red Water.

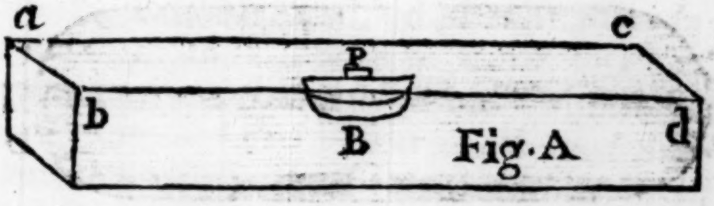
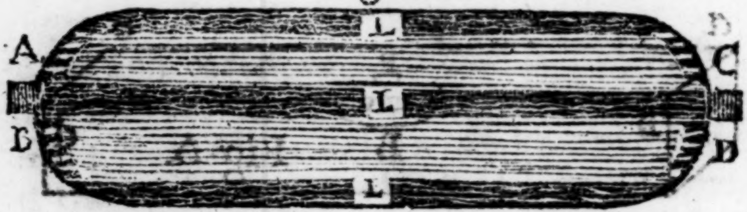


Fig. A

Now, the Fiſh-Veſſel deſign'd being 40 Foot by the Keel, if you divide 5280, the Feet in a Mile, by 800 Foot, 20 Times her Length, the Quotient ſheweth ſhe diſcharges herſelf of all her old Water ſix Times and ſix Tenths in a Mile, or 33 Times every 5 Miles.

From which it appears by Demonſtration, that the whole Maſs of the Parts of Water are mov'd more or leſs, by the Motion of any of them, in Proportion to the Magnitude and Velocity of the Bodies which preſs upon them, and the Succeſſion of freſh Air and Water in the Veſſel to be accordingly: So that the whole Body of Water contain'd in ſuch a Veſſel will be chang'd, as aforeſaid, in 20 Times its Length; and the more ſwift the Motion of the Veſſel is, the more rapid the Current will be thro' her, as in *Fig.* 4. where A B C D repreſent the Iron Gratings 'fore and aft', thro' which the Water paſſeth, forming the Currents A C and B D; whoſe Motion is nearly equal, tho' in a contrary Direction to that of the Ship.

Fig.4



In the Hold are put Stops, to throw ſome Part of the Water into Eddies, as L L L; that the Fiſh may not be hurt by its Velocity, but ſwim and play as eaſy as in the free and open Sea.

The laſt Experiment was by the aforeſaid Veſſel with the Glaſs Deck, whoſe Hold had Gratings 'fore and aft', and was full of Holes on the Sides; the Length of it was 12 Inches, and Breadth 4, which makes 16 Inches for the Height of the Main-maſt; but we made it 20 Inches long; and when it floated on the Water, we found it truly boyant, and neither too *crank* nor too *ſtiff*.

Then we ſtopp'd up the ſaid Gratings and Holes in her Sides, and ſunk her 'till ſhe drew as much Water as before; which we effected by loading her with dry Gravel, and found her then ſomewhat *more ſtiff*; becauſe, by ſo much as the *Gravel* is heavier than Water of the ſame Magnitude, it muſt lie farther from the *Center of Motion*, and make her too ſtiff. This proves Water to be the trueſt Lading, and was ſtill a Confirmation of this *new Invention*.

Thus far we have prov'd the Capacity, the Aptneſs, the Power, and Commodiouſneſs of our Veſſel; after all which, we may ſtill fail, if we do not underſtand the Nature of Lading, which Experience and Wiſdom has brought to Light and Practice among Men.

To avoid any Error from Inadvertency this Way, it was well debated and conſider'd, that there is a great Difference between a Shipwright's and Merchant's Way of calculating the Tunnage of a Ship; and finding this Difficulty, made us think it proper to examine, from the Nature of the Thing itſelf, how many Tuns *Averdupois* Weight a Ship will carry.

The Shipwright's Way is to multiply the Length of the Keel by the middle Breadth, and that Product by half the Breadth, and then they divide the laſt Product by 94, and the Quotient is the Tunnage.

The *Fiſh-Pool Sloop* is 40 Foot by the Keel, and 17 Foot Broad in the Midſhips, which, by their cuſtomary Rule, meaſures 61.5 Tuns.

To find how many Tuns Weight a Ship will carry.

The *Fiſh-Pool Sloop* being Inched according to common Gauging, the mean Length in the Hold is 42 Feet, mean Breadth is 13.687 Feet, and Depth 6 Feet, which multiply'd together is 3449.124 Cubick Feet of Water; each Foot of Salt Sea Water, by the niceſt Experiments, weighing 64.25 Pounds,* and a Cubick Foot of clear freſh Water weighs but 62.75 Pounds, which is the very Reaſon why a Ship is more boyant in ſalt Water than in freſh: Now if the Cubick Feet of ſalt Water in the Hold be multiply'd by 64.25 Pounds, (the true Weight of a Cubick Foot of Sea Water) it will be 221606 Pounds *Averdupois* Weight, or 98 Tuns, 18 Hundred, 2

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* See Ward's Tables.

2 Quarters, and 14 Pounds; and ſo much Weight of any Sort of dry Goods muſt be in the Hold of a Ship of her Burthen, to make her neither too crank nor too ſtiff; and this Weight is no more than what is commonly allow'd by Merchants themſelves, of Box, Bale, or Caſe Goods, by allowing 66 Cubick Feet to a Tun in Bulk. Suppoſe you have 6 Bales of Goods, 6 Foot long, 2 Foot broad, and 2 deep; multiply the Length, Breadth, and Depth, one into the other, the Product is 24 Cubick Feet for one Bale; and that multiply'd by 6, is 144 Cubick Feet in the 6 Bales; the whole divided by 66, the Quotient is 2.182 Tuns. We will ſuppoſe this 2.182 Tuns to be Red Wine, of which a Cubick Foot weighs 62.06 Pounds *Averdupois*, the Goods before-mention'd meaſure 144 Cubick Feet, which multiply'd by 62.06, the Product is its true Weight, *viz.* 3 Tuns, 19 Hundred, 3 Quarters, and 4 Pounds; or ſuppoſe it be Oyl Olive, of which 57.06 Pounds is a Cubick Foot, then the aforeſaid 2.182 Tuns, or 144 Cubick Feet of Oyl Olive will weigh 3 Tuns, 13 Hundred, 1 Quarter, and 12 Pounds; and the Quantity of the *Fiſh-Pool*'s Hold, as before-mention'd, is 3449 Cubick Feet, divided by 66 Cubick Feet, the Quotient is 52.25 Tuns of Merchants Tunnage; which ſaid 3449 Cubick Feet, or 52.25

Tuns,

Tuns, we will proportion to the ſeveral Weights of Liquids following, *viz.* that 1 Cubick Foot of ſalt Water weighs 64.25 Pounds, of clear freſh Water 62.5 Pounds, Red Wine 62.06 Pounds, and Oyl Olive 57.06 Pounds *Averdupois* Weight. If ſo,

Then 66 Cubick Feet, or 1 Tun of Merchants Allowance will weigh,

	hun.	*qu.*	*p.*
If Salt Water	37	3	12
Clear freſh Water	36	3	9
Red Wine	36	1	26
Oyl Olive	33	2	14

It is plain that different Solids and Liquids have different Weights, and, by Conſequence, all different Cargoes muſt vary the ſame, as appears by the Table following.

That a Hold meaſuring 3449 Cubick Feet

	Tun	*hun.*	*qu.*	*p.*
Of Salt Water is	98	18	2	14
Clear freſh Water	96	4	2	18
Red Wine	95	11	0	13
Oyl Olive	87	17	0	16

This Account is purely to ſatisfy thoſe that are not acquainted with the Nature of theſe Things, that ſo much Goods ought to be in the Hold, as is equal to ſuch a Weight of Water as would fill the

Hold, and will bring the Ship down ſo far into the Water as is limited; for the Weight of Goods preſſes out no more Water than would fill the Hold; and if the Goods are lighter or heavier than Water of the ſame Magnitude, the Ship will be either *too ſtiff* or *too crank*, as will be demonſtrated in its proper Place.

The next Thing we conſider'd was, how much all the Timber, that bounds the Hold from the Floating-Deck to the Keel, is lighter than Water of the ſame Magnitude.

The Keel, Floor-Timbers, Kelſon, Stem, Stern-Poſt, dead Wood 'fore and aft', and Step of the Maſt, were exactly meaſur'd, and found to be 649.5 Cubick Feet. By the beſt Experiments that have been made, * a Cubick Foot of ſound dry Oak will weigh 58 Pounds, by which multiply the ſaid 649.5 Feet, the Product is 37671 Pounds *Averdupois* Weight,

	Tun	*hun.*	*qu.*	*p.*
Or,	16	16	1	10
Iron Bolts, Gratings, &c.	01	00	0	00
Clay abaft ——— ———	02	00	0	00
Total	19	16	1	10

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* *According to* Ward's *Book.*

	Tun	*hun.*	*qu.*	*p.*
649.5 Cubick Feet of Sea Water, of the ſame Magnitude of the Timber, at 64.25 Pounds each Foot ———	18	12	2	10
Two Tuns of Clay abaft, being twice as heavy as Water of the ſame Magnitude, and therefore takes up but half the Room of Water, the ½ is	01	00	0	00
Total	19	12	2	10
From	19	16	1	10
Take	19	12	2	10
Remains	00	03	3	00

Which is over and above the Weight of Water.

The ſpecifick Gravity of Bodies of the ſame Magnitude will preſs them downward, if heavier than Liquids; and the Liquids will preſs them upward, if lighter.

	Tun	*hun.*	*qu.*	*p.*
Add the Water in the Hold	98	18	2	14
To the Weight over and above the Weight of Water ———	00	03	3	00
The Total	99	02	1	04

Is the whole Weight under the Floating-Deck, or the true Weight a Ship for this Purpoſe ought to have; and, to be ſure, a great deal of Care muſt be taken, that there is but a ſmall matter of Weight added more to the Timber, Iron, *&c.* than the Weight of Water of the ſame Magnitude of the Timber.

The next Thing we conſider'd, was the Weight of every Thing above the Floating-Deck, the Weight the Sloop will carry between Decks, and by Conſequence, how many Inches the Floating-Deck will ſink under the Superficies of the Water on the Outſide of the Sloop, and from thence, how much Water ſhe will bear between-Decks before ſhe will ſink.

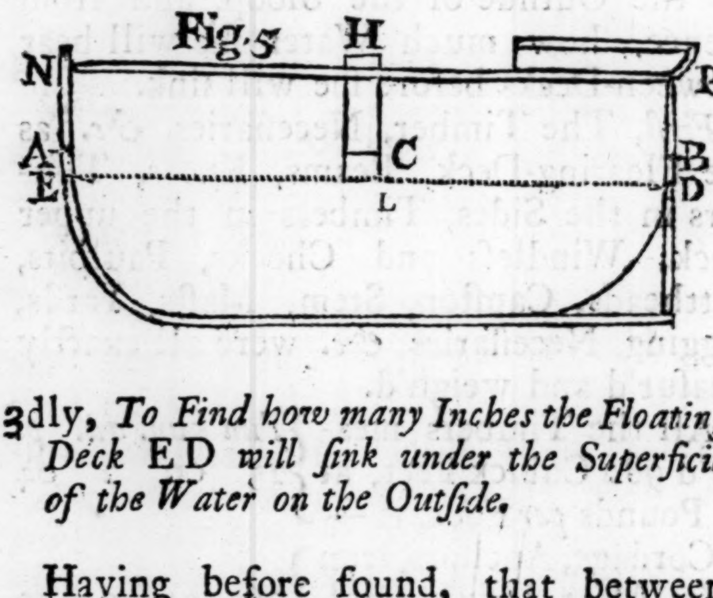
Firſt, The Timber, Neceſſaries, *&c.* as the Floating-Deck, Beams, Knees, Timbers in the Sides, Timbers in the upper Deck, Windleſs and Cheeks, Paulbits, Cattheads, Capſton, Stem, Maſts, Yards, Rigging, Neceſſaries, *&c.* were all exactly meaſur'd and weigh'd.

	Tun	*hun.*	*qu.*	*pl.*
All the Timbers meaſur'd 982 Cubick Feet, at 58 Pounds *per* Foot, is —	25	00	2	04
Cordage, Anchors, Iron Bolts, Meat, Drink, Coal, ſix Men, *&c.* Weight —	06	00	0	00
Weight in all	31	00	2	04

2dly, *What Weight ſhe will carry between Decks, and how many Inches the Floating-Deck will ſink under the Superficies of the Water on the Outſide.*

Length of the Deck E D 50 Foot, mean Breadth 16 Foot, and Depth 6 Foot, which, multiply'd one by the other, is 4800 Cubick Feet, and multiply'd by 64,25 Pounds, the Weight of a Cubick Foot of Water, the Product is 308400 Pounds *Averdupois*, or 137 Tuns, 13 Hundred, 2 Quarters, and 8 Pounds, between-Decks E N P D.

Fig. 5



3dly, *To Find how many Inches the Floating-Deck* E D *will ſink under the Superficies of the Water on the Outſide.*

Having before found, that between-Decks ſhe meaſures 4800 Cubick Feet of ſalt Water, at 6 Foot deep; then every Inch deep muſt contain 66,666 Cubick

Feet of ſalt Water, allowing 64.25 Pounds to a Cubick Foot, as before, the Weight is 38 Hundred, and 27 Pounds on every Inch deep; now, if 38 Hundred and 27 Pounds ſink the Floating-Deck 1 Inch, then all the Timbers, Cordage, Anchors, *&c.* being 31 Tuns and 60 Pounds, as before-mention'd, will ſink it 16.227 Inches under the Superficies of the Water on the Outſide of the Middle-Deck; that is, the Floating-Deck E D in *Fig.* 5. will be 16.227 Inches under Water, as E A or D B.

The aforeſaid E A or D B is 16.227 Inches; the Depth of the Arch of the Deck thwartſhips is 4 Inches; the ½ is 2 Inches, which 2 Inches added to 16.227, makes 18.227 Inches, the Depth of the Water in the Well, as L C; then take 18.227 Inches, as L C, from 6 Foot as L H, the Remainder is almoſt 54 Inches, or 4 Foot 6 Inches, as C H equal to B P, or A N, free Board.

Now, (as we prov'd before, that the Hold meaſur'd 3449 Cubick Feet, allowing 66 Cubick Feet to a Tun, Merchants Tunnage) the *Fiſh-Pool Sloop* is not quite 53 Tuns; and where is any Ship of her Burthen more than 4 Foot 6 Inches free Board when loaden, beſides the Thickneſs of her upper Deck Plank, and 2 Inches more to the Scupper-Holes?

4thly, *How much Water the* Fiſh-Pool Sloop *muſt take in between-Decks, to make her ſink, and conſequently, whether this* Fiſh-Veſſel *is as ſafe as a Merchant-Man, or leſs dangerous than a common* Well-Boat?

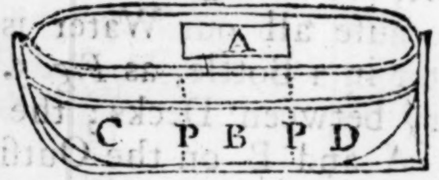
In order thereunto, we muſt find how much Water ſhe muſt ſhip between-Decks to make her ſink.

We have calculated before, that between-Decks E N D P meaſures 4800 Cubick Feet, and allow'd 64.25 Pounds to a Foot of ſalt Water, the Weight is 137 Tuns, 13 Hundred, 2 Quarters, and 8 Pounds: We have likewiſe before calculated that 38 Hundred, and 27 Pounds Weight of Water will ſink her but 1 Inch, then, if 1 Inch requires 38 Hundred and 27 Pounds to ſink it, then 4 Foot 4 Inches, the Remains of the 6 Foot between-Decks, as B P or A N, will require 99 Tuns, 8 Hundred, 2 Quarters, and 4 Pounds; ſo, by Conſequence, ſhe much ſhip ſo much Water before ſhe can ſink; and if by God's Bleſſing, we can keep all Things Cloſe in a Storm, ſhe is a great deal ſafer than any other Veſſel; becauſe, if you ſpring a Lake in a Merchant-Man, ſhe muſt ſink, if you cannot keep her free with the Pumps; but in this *Fiſh-Veſſel*, the Floating-Deck being under your Feet, the Lake may be ſeen, and ſtopp'd immediately.

Farther, we are much ſafer than a *Well-Boat*, becauſe all our Water is confin'd, like Water in a Bottle, as *Fig.* 5. E D N P is all dry between Decks; the Veſſel is ſunk to A and B on the Outſide of the Ship; and if ſo, by Conſequence the Water in the Well will riſe to C. Now conſidering how the Deck ſhe ſwims on E L D is preſs'd down into the Water as deep as E A or D B, how is it poſſible, under ſuch a Confinement, the Water ſhould be toſs'd by the Sallies of the Veſſel (occaſion'd by the Surges of the Sea) from one Side to the other, like a common *Well-Boat*?

Again, How can it be, but that there muſt enſue a conſtant Succeſſion and freſh Supplies of Water, ſince ſhe hath large Gratings before, containing 360 ſquare Inches, to let the Water in; and abaft, Gratings of 740 ſquare Inches, to let the Water out; and the Conveniencies of large Blow-Pipes, to vent what Air ſhall happen to be forc'd in by the Riſings of the Veſſel in head Seas.

Fig. 6



But the *Well-Boat* is of a Different Nature, as in *Fig. 6*, which repreſents an *Engliſh Well-Boat*, A, the Mouth of the Well, B, the whole Body to contain the Fiſh; PP, two Bulk-heads, or Ends of the Well, running athwartſhips; ſo Part of the two Sides, and the two Bulk-heads or Ends, make the Well; C D, all Cavity between the Bulk-heads and the two extreme Ends of the Boat, to make her boyant.

It is impoſſible ſuch a form'd Veſſel as this ſhould approve itſelf to the Examination of thoſe in this Great City, who underſtand the Nature and Reaſon of Things, and whoſe Buſineſs it is, on a diligent Enquiry, either to correct, approve, or reject it. Which proves it was never calculated by Art, but brought to what it is by the long and dear Coſt and Experience of ſome poor publick-ſpirited Fiſhermen.

For, 1*ſt*, no manner of Proviſion was made for the Conveyance of Air, without which no Creature can live.

2*dly*, On every Sally of the Boat, the Water in the Well muſt ſhift its Place; and in violent Seas it ſometimes hath forced the Hatches open which cover the Well, and ſometimes breaks thro' the Bulk-heads.

Beſides this, how uneaſy muſt the Fiſh be in ſuch violent Motions, to be batter'd againſt the Sides of the Well; and if a Calm happen, the Water having no Motion, the Fiſh muſt in a little Time be ſuffocated: And at the very beſt, they have no Relief by freſh Supplies of Water, but by the Veſſel's tacking about; and then, perhaps, the Fiſhes Motion, and ſtrugling for Life, may preſs out ſome filthy Slime, thro' the Holes in the Sides of the Well, and ſo make their Situation a little more healthful.

The next Thing we are to prove is, That Water is as good, or, indeed, better Lading than any dry Goods whatſoever.

Suppoſe, (ſo far as the Ship ſinks in the Water) an imaginary Line to go from Stem to Stern; in that Line lies the *Center of Motion* of the Ship; and the *Center of Gravity* not being in the *Center of Motion*, it will deſcend 'till it comes under the *Center of Motion*; and the farther it is diſtant from the *Center of Motion*, the more will its Weight be, and the nearer, the leſs; ſo as to render her accordingly more ſtiff or more crank.

The *Fiſh-Pool Sloop* will carry in her Hold 99 Tuns Weight, or 52 Tuns of Merchants Allowance, reckoning 66 Cubick Feet to a Tun, as hath been before prov'd.

Fig. 7.

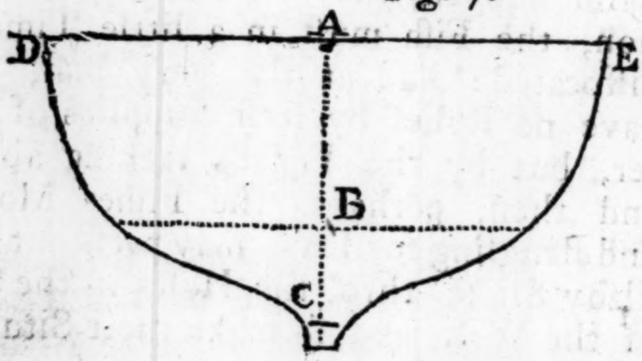


Fig. 7. *Suppoſe a Ship laden with 99 Tun Weight of Lead, and that ſhould lie in the Bottom of the Hold, to the Height* BC, *and equal to the whole Weight of Water that would fill the Hold* DEC.

It is plain here, that A is the Center of Motion, on which the whole Body moves; and every Man, concern'd in Sea Affairs, knows by Experience, (and that ſometimes dearly bought too) that there is a Neceſſity of raiſing the Weight of Lead nearer the Center of Motion A, by dividing the Weight, and laying ſeveral Ranges of

Billet-Wood between the like Ranges of Lead; or elſe the Ship would lie ſo ſtiff in the Sea, that ſhe could not yield to the Wind; by which Oppoſition, all the Maſts would be blown down, or brought by the Board, and the Seas would make a high Road over her Decks. Which proves, that by ſo much as the Cargo is heavier than Water of the ſame Magnitude, by ſo much the Ship will be ſtiffer than ſhe ought to be, and move the heavier upon the Center of Motion A towards D or E; becauſe, the Quantity of the Lead B C, in the Bottom of the Hold is *99* Tuns, and that of Sea Water of the ſame Magnitude B C, would be but a little above 11 Tuns; for, a Cubick Foot of Lead is 707 Pounds and 13 Ounces, and a Cubick Foot of ſalt Water 64 Pounds and 4 Ounces.

Fig. 8.

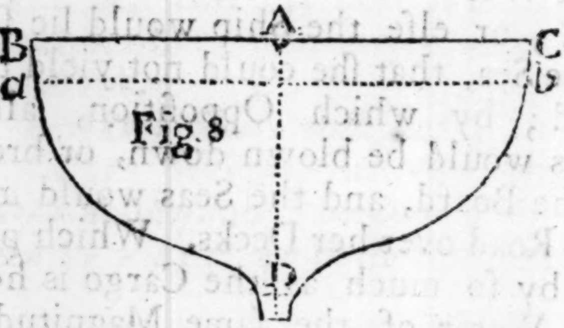


Fig. 8. *Suppoſe a Ship laden with 99 Tuns of Sugar as deep as* a b, *and which Loading lies nearer the Center of Motion* A *than the former Cargo of Lead did.*

By ſo much as the Cargo of Sugar a b D, is heavier than Sea Water of the ſame Magnitude, by ſo much ſhe is too ſtiff; becauſe, the Magnitude of Sugar a b D is 99 Tuns Weight, and Water of the ſame Magnitude is but 80 Tuns Weight; therefore the Ship muſt be too ſtiff, and moves the heavier upon the Center of Motion A towards B or C.

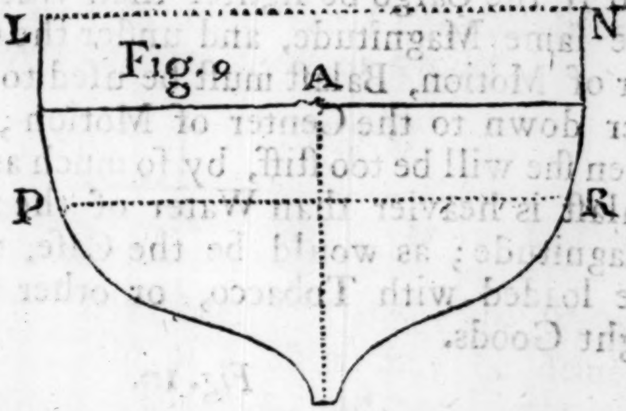


Fig. 9. *Suppoſe a Ship be laden with* 99 *Tuns Weight of lighter Goods, where a great Part of it muſt be ſtow'd between-Decks, or above the* Center of Motion A, *as high as* L N.

Now, by ſo much Weight as is between-Decks A L N, on every Sally of the Ship, ſo much is the Weight in the Hold A P R leſſen'd: For by ſo much as the Cargo is lighter than Water of the ſame Magnitude, by ſo much the Ship muſt be cranker, and be conſequently more in Danger to overſet: For, all the light Goods that will fill the Hold and between-Decks, will weigh but 99 Tuns, which is her real Cargo; and Water of the ſame Magnitude (that is, were the Hold and between-Decks full of Water) would weigh 198 Tuns; which plainly proves ſhe hath 99 Tuns

Weight to aſſiſt the Wind to overſet her. But if the Cargo be lighter than Water of the ſame Magnitude, and under the Center of Motion, Balaſt muſt be uſed to ſink her down to the Center of Motion; but then ſhe will be too ſtiff, by ſo much as the Balaſt is heavier than Water of the ſame Magnitude; as would be the Caſe, were ſhe loaded with Tobacco, or other ſuch light Goods.

Fig. 10.

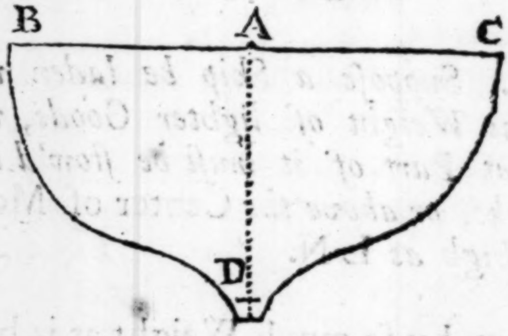
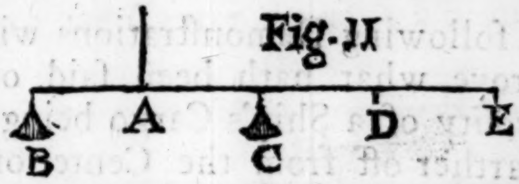


Fig. 10. But if a Ship hath 99 Tuns Weight of ſalt Water in the Hold BACD, and that Water be ſtopp'd down, (as is the Caſe of our FISH-POOL) it muſt needs lie there more equal and uniform than any Cargo of Goods can poſſibly do; for it will lie, with Regard to the Motion and Sallies of the Ship, juſt as if it were congeal'd into a ſolid Body of Ice of the ſame Weight and Magnitude. And it is impoſſible, that any Kind of dry Goods (not even Corn itſelf, were her Hold full of it, and well caulk'd down) can be ſtow'd ſo commodiouſly; neither can ſuch a Ship, thus moving upon the Center of Motion A, be either *too crank* or *too ſtiff*.

Fig. 11



What hath been ſaid about the Weights in the Hold of a Ship, may be demonſtrated by a Balance, and needs not any large Explication, the Properties of the *Libra*, or Balance, being ſo well known; but, for Illuſtration, be pleas'd to obſerve, that if the Weights at the Ends be equal, and at equal Diſtances from the Center of Motion, it will cauſe an Equilibrium, and the Center of Gravity will be in the Center of Motion, as *Fig.* 11, A is the Center; ſuppoſe B and C equally diſtant from the Center A, it is plain the Beam will be horizontal; but if the Weight C be ſlipp'd to D, the Beam muſt of Neceſſity decline; becauſe A D being double the Diſtance of A B, half the Weight at D will balance B; and if the Weight be mov'd to E, being three Times the Diſtance A B, one Third will balance the Weight B; that is, were the Weight B 30 Pounds, 10 Pounds at E would bring the Beam to a Balance; that is, the Power at E muſt be of the ſame Proportion to the Weight B, as the Diſtance AB is to the Diſtance A E.

The following Demonſtrations will farther prove what hath been ſaid of the Ponderoſity of a Ship's Cargo being nearer or farther off from the Center of Motion.

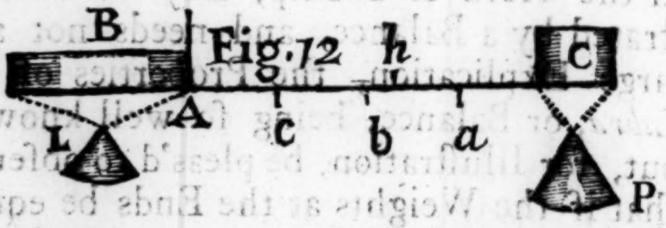


Fig. 12. B repreſents the Materials above the Floating-Deck, L the Weight of the ſaid Materials 6 Tuns, C the Lead in the Hold, P the Weight of the ſaid Lead 99 Tuns, and A the Center of Motion: Now, ſo far as the Weight P (being the Center of Magnitude to C) is remov'd from the true Center of Magnitude *b*, (if the Hold was full of Water) by ſo much the Ship muſt be too ſtiff; for the Weight P, being four Times and a Half diſtant, more than L, from the Center of Motion A, the Weight L muſt be 445 Tuns, 10 Hundred, to poize the Weight P; and how is it poſſible ſuch a Veſſel ſhould yield to the Wind, to move 445.5 Tuns, but all the Maſts muſt be blown by the Board. To prevent which, the Lead C muſt be broken into Parts, and by Billet-Wood, or ſome ſuch light Thing, between, rais'd to the Center A, as a b c, as aforeſaid.

Fig. 13

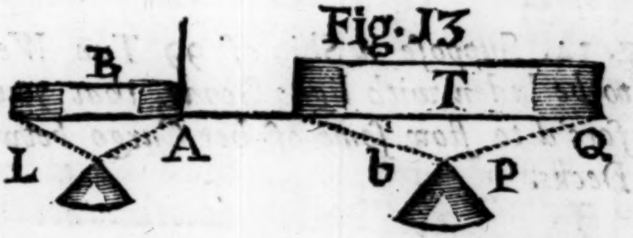


Fig. 13. B repreſents the Materials, as aforeſaid, L the Weight of the ſaid Materials, T the Sugar in the Hold, P the Weight of the ſaid Sugar, and A the Center of Motion: The Weight P being 99 Tuns, and three Times farther from the Center of Motion A than L, the Weight L muſt be 297 Tuns, to balance the Weight P of 99 Tuns, and muſt be rais'd gradually from Q to the Center of Motion A, to make her truly boyant; Therefore, ſo far as the Weight P, (being the Center of Magnitude to the Sugar T) is remov'd from the Center of Magnitude *b*, if the Hold was full of Water, by ſo much ſhe muſt be too ſtiff, and ought likewiſe to be rais'd to the Center of Motion A.

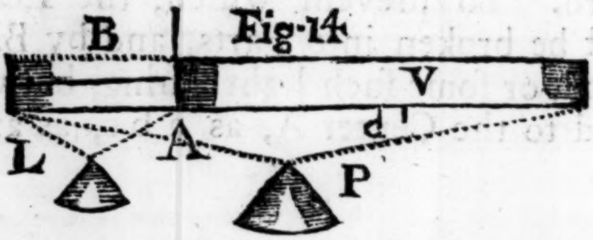


Fig. 14. *Suppoſe a Ship of 99 Tun Weight to be laden with light Goods, that you are forc'd to ſtow ſome of her Cargo between-Decks.*

Let V be light Goods in the Hold, and B Part of the light Goods between-Decks, L the Weight of the Goods between-Decks, *viz.* 30 Tuns, and likewiſe the Weight of the Materials above the Floating-Deck, *viz.* 6 Tuns, which added, makes 36 Tuns, and P the Weight of the Goods in the Hold, *viz.* 69 Tuns: Now, ſo far as the Weight P is drawn towards the Center of Motion A, from the Center of Gravity of the Goods that ſhould be in the Hold, *viz.* *d*, by ſo much the Weight of ~~Goods betw~~een-Decks muſt be added over and above to the Weight L, and makes the Ship too crank; for which Reaſon, Balaſt muſt be in the Bottom of the Hold, to make her ſtiffer.

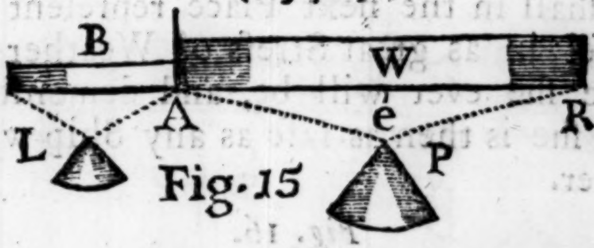


Fig. 15

Fig. 15. B Repreſents the Materials above the Floating-Deck, L the Weight of the Materials 6 Tuns, W the Water in the Hold, P the Weight of the Water in the Hold 99 Tuns; this proves that the Weight P, lying under the Center of Gravity or Magnitude e, or between the Center of Motion A, and the End of the Beam or Kelſon of the Ship R, the Veſſel muſt be truly boyant, if you pitch your Deck in a true Height from the Kelſon, otherwiſe ſhe muſt be too ſtiff or too crank. This proves, as before-mention'd, that the Water in the Hold will divide itſelf naturally into ſuch equal Parts, from R to the Center of Motion A, as no dry Goods can be made conform to. Therefore Water is the moſt proper Cargo to make a Ship truly boyant; and in all other Lading the Goods will be either above or below the Center of Motion A.

Now, when the Reader comes to be convinc'd by Demonſtration, that what has been above deliver'd is Matter of Fact, I hope there will be no Room for any farther Objections.

I ſhall in the next Place repreſent this Veſſel in as great Streſs of Weather as I hope ſhe ever will be, and demonſtrate that ſhe is then as ſafe as any Ship whatſoever.

Fig. 16.

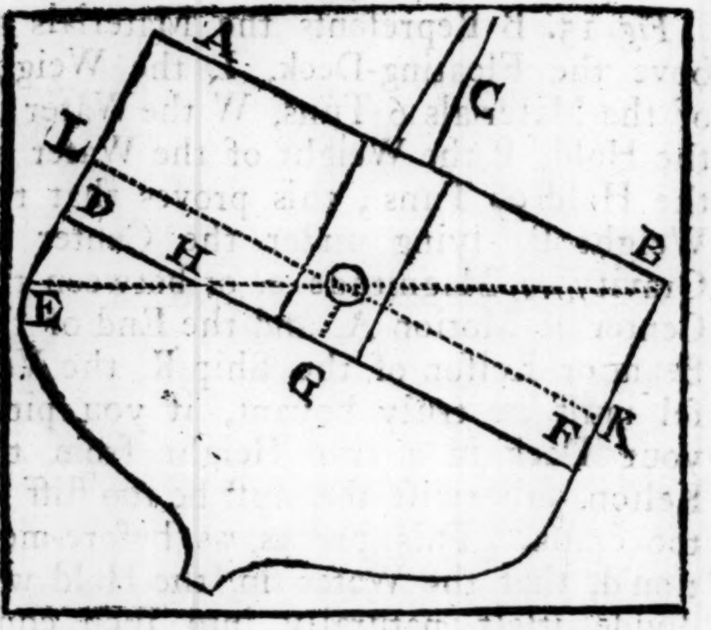


Fig. 16. A B the Upper-Deck, D F the Floating-Deck, L K equal with the Superficies of the Water on which ſhe ſwims when upright, in which is the Center of Motion ⊙; E B equal with the Superficies of the Water on which ſhe now ſwims, heeling down to the Scupper-Holes of the Upper-Deck, and paſſing thro' the Center of Motion ⊙ as before; therefore, ſo deep as the Floating-Deck is ſunk down under Water by the Weight of Timber, Iron, Rigging, *&c.* as DL or FK, ſo deep is the Water in the Well, as G ⊙. Obſerve, altho' all between Decks, as ABDF is Cavity and dry, and holds 137 Tuns, 13 Hundred, 2 Quarters, and 8 Pounds; yet nevertheleſs, the whole Veſſel being ſunk to LK, and ſupported on the Outſide by a Trapeſium of Water, as before ſhew'd, the real Cavity between Decks, as LA, KB, meaſures but 99 Tuns, 8 Hundred, 2 Quarters, and 4 Pounds.

Now, conſidering how the Veſſel is born down on one Side, by the Sails on the Maſt C, in a violent Storm, the Point K being the Height of the Water on the Outſide when upright, will be preſs'd under Water as deep as B, and forms a new horizontal Line E ⊙ B, on which ſhe now ſwims; and by Conſequence muſt form the Triangle ⊙ BK, whoſe Baſe ⊙ K is 8 Foot, (the ½ of LK thwartſhips) and the Perpendicular KB, the Depth between - Decks, from the Superficies of the Water to the Upper-Deck, is 4 Foot 6 Inches, whoſe Superficies ⊙ KB is 18 Foot; the Length of the Sloop from Stem to Stern is 50 Foot, which multiply'd by the Superficies ⊙ KB 18 Foot, makes 900 Cubick Feet; which ſaid 900 Feet multiply'd by 64.25, the Weight of a Cubick Foot of Salt Water, the Product is 57825 Pounds, or 25 Tuns, 16 Hundred, 1 Quarter, and 5 Pounds. Now let any Sea-faring Man judge how great ſuch a Storm muſt be, to heel a Veſſel of her Burden up to her Scupper-Holes, when there is almoſt 26 Tuns of Cavity, equal in Weight to ſalt Water of the ſame Magnitude, to preſs down to B, beſides her Weight in the Hold. All the Water (by ſuch a Heel) that is empty'd out of the Hold, is comprehended in the Triangle E H D; which is ſo inconſiderable, that it is not worth taking Notice of; becauſe what Air is taken in at ſuch a Time, will be forced out at the Air-Pipes, when the Veſſel rightens again. So conſidering the Condition of this Veſſel, and of another laden with dry Goods, we are as ſafe as any Ship whatſoever; for all Ships can but move upon the Center of Motion; and when ſhe is forc'd by the Wind on one Side, ſhe can preſs no greater Weight of Water than the Cavity (that is preſſed down under Water) will hold.

The next Thing incumbent on us is to prove, that ſuch a Veſſel, freighted with Water and Fiſh, and a Current running thro' her at Command, will feel her Helm, and ſteer as well as any Veſſel whatſoever, if her Rudder be made in

Proportion to her Burthen, and properly fix'd. This becomes neceſſary from a receiv'd Notion, that this Veſſel, whoſe Lading is only Water and Fiſh, will neither ſteer nor ſail.

To obviate this Objection, it muſt be well underſtood, that no Ship will ſteer, but in a Current in a contrary Direction to that of the Ship; that is to ſay, the Helm muſt oppoſe or preſs againſt the Body of Water in which the Veſſel works, to make her alter her Way or Courſe.

We will conſider this, 1*ſt*, in a ſtanding Water; 2*dly*, againſt a Current; and 3*dly*, with a Current.

Fig. 17.

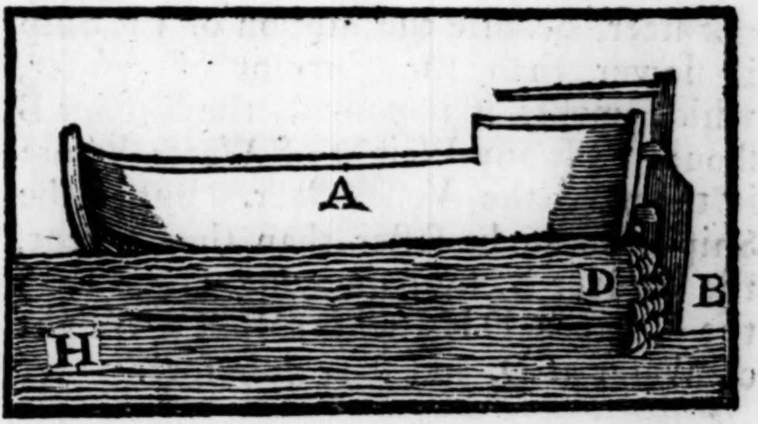


Fig. 17. Suppoſe D H to be a ſtanding Water, and the Veſſel makes her Way from D towards H: Now the Veſſel's

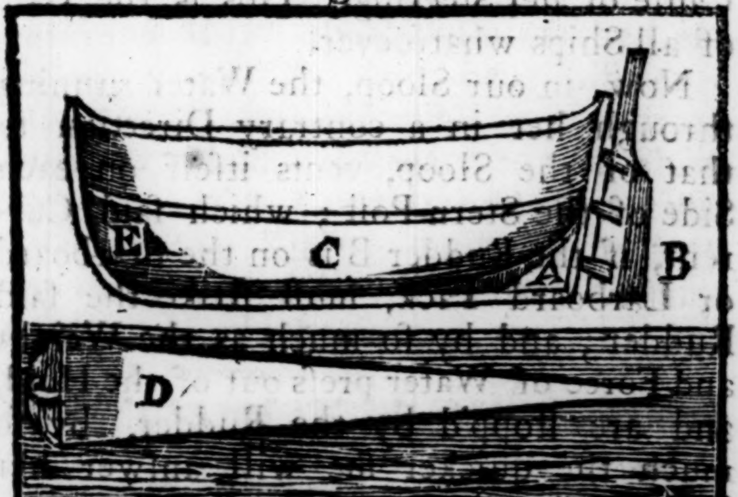
Motion preſſes the Rudder B againſt the Body of Water D, by which Means the Veſſel is thruſt round at the Stern on the Center A.

2*dly*, If ſhe ſails againſt a Current, as, ſuppoſe the Current runs from H towards D, and the Veſſel ſails from D towards H, if ſhe makes any or no Way through the Current, or falls a-ſtern, yet if her Head be to the Current, ſhe will ſteer; becauſe the Rudder B preſſes againſt the Current H D at D, and turns the Veſſel in the ſame Manner as aforeſaid.

3*dly*, Suppoſe a Veſſel ſails with a Current, as from D towards H; if ſhe hath not more Way than the Current, ſhe cannot ſteer, becauſe the Motion of the Ship is ſlower than the Current of Water, which makes it impoſſible the Rudder B ſhould preſs any Weight of Water before it to make the Veſſel ſteer. But if the Ship's Motion be faſter than the Current, the Rudder B, by its moving faſter than the Current D H, will collect a Weight of Water at D, and ſteer as before.

I think it will be proper to take the Sloop (as at *Fig.* 17.) out of the Water, and examine where her Imperfections can be, that ſhe will not (as reported) ſail and ſteer, as well as any other Veſſel. Firſt, I think it proper to enquire into the Reaſon, according to Nature and Philoſophy, why any Ship, Sloop, or other Veſſel, ought to be built broader at the Bows than at the Stern, and likewiſe cleaner abaft than before, if you intend ſhe ſhall ſteer or ſail well.

Fig. 18.



Suppoſe *Fig.* 18, to be the Hull of a Ship or Sloop: The Triangle A is the moſt Part of it dead Wood, that is work'd and fill'd up with ſolid Timbers, and no thicker than the Stern-Poſt, on which the Rudder hangs; but from thence (being ſkinn'd over with Plank) it grows wider and wider, to the whole Breadth of the Bulge at C, which they call a clean Tail; and from the Stem at E it is ſomewhat clean'd off underneath; that by the Ship's preſſing forward, her broad Bows at E will contract the Water, like a Current, to the clean Tale at A, and cauſe the Rudder B to preſs againſt it, which is the Cauſe of her Steering. This is the Caſe of all Ships whatſoever.

Now, in our Sloop, the Water running through her in a contrary Direction to that of the Sloop, vents itſelf on each Side of the Stern-Poſt; which ſaid Current, if the Rudder B is on the Starboard or Larboard Tack, muſt ſtrike the ſaid Rudder; and by ſo much as the Weight and Force of Water preſs out of the Hold, and are ſtopp'd by the Rudder, by ſo much the quicker ſhe will anſwer her Helm.

But ſuppoſing (tho' far from granting) that ſhe will not ſteer ſo well with the Current running through her, we can (upon a Lee Shore, or any other Occaſion) immediately ſtop all the Sluices 'fore and aft', and make her a whole Veſſel, as of the ordinary Form. And again, by opening the Sluices, in the Space of half a Minute, we can relieve our Fiſh with a full freſh Supply of Water: We ſay, were it ſo (as we aſſert it is not) it would be great Injury to value this Veſſel like a *Well-Boat*, wherein Fiſh cannot have freſh Supplies of Water, perhaps, in a Month or ſix Weeks together; and which is no other than a Vehicle to bring Fiſh waſting alive, and to be deliver'd ſick and decay'd, inſtead of (what is much better) freſh and juſt dead.

Now farther, as to her ſailing ſo well as another Ship; the Nature of the Cargo (Water and Fiſh) hath been ſufficiently explain'd already, and (made appear) are in the Hold, in Regard to the Ship, better than dry Goods; and if a Fiſh-Veſſel of this Kind is built in its true Proportion, ſhe will ſail as well as any Merchant-Man whatſoever; but Miſtakes and Inadvertencies often happen to Veſſels, for want of knowing the true Reaſon of Things; and particularly, why a Veſſel ought to be broader before than abaft, which is demonſtrated in *Fig*. 18. Suppoſe D and F to be two Pyramids, by 2 Lines at the Ends, force them equally, the Pyramid D will move faſter than F; becauſe the great End moves or forces but little Weight of Water more than the Cube of the Square at the End doth contain: But the Pyramid F moves with the Point forward, like a Wedge, preſſing as much Water as its own ſolid Body contains.

This proves how cautious Perſons ought to be how they pinch in a Veſſel Before, and leave her too broad Abaft; for certainly nothing can be more hurtful to the Sailing of a Ship, than a Neglect in this Particular.

Thus, we hope to have fully clear'd the Suſpicion, which is grounded only on the Circumſtance of the Water paſſing thro' her Hold, that ſhe will not ſteer or ſail: For ſhe has, you ſee, an Advantage in the Current paſſing thro' her, for feeling her Helm quicker, and conſequently, as we have juſt now ſhewn, is more likely to ſteer readily than any other Ship; if it be now remember'd alſo, that we have before prov'd, that Water is a better and ſafer Lading than dry Goods, we need only add concerning the Steerage of our Sloop, that whether our ſkilful and ingenious Builders, Mr. *French* and Mr. *Williamſon*, or any other, ſhall build a Veſſel of the common Structure, they will be as unable to anſwer for her ſteering or ſailing better or worſe than any other Veſſel that ſhall be nam'd, as they muſt be as to one of this Sort. From all which it appears, that there is nothing particularly diſadvantageous in our Sloop, as to her Capacity for ſteering or ſailing.

The laſt Thing we conſider'd was, how to ſupply the Fiſh with conſtant freſh Air and Water; and to limit the Water, ſo that the Currents thro' the Hold ſhall be no ſtronger at one Time than at another, by which Means the Fiſh will be as eaſy in a Storm as in a Calm. This is effected by Sluices in the Hold, that ſtop and let go the Water thro' it, to the 10th Part of an Inch. But becauſe this is to be done by the Run of the Sloop, meaſur'd by a Log-Line, we think it proper, in the firſt Place, to inform you what the Log-Line is, that meaſures the Diſtances run at Sea, and how the Knots are knit at their true Diſtances, by which we regulate the Flux of Water into the Hold.

Note, That the Equator is divided into 360 Degrees, and each Degree into 60 Parts call'd Miles: And the Diſtance on any Meridian is divided likewiſe into the ſame equal Parts as the Equator, *viz.* 60 Miles or Parts to a Degree: This does not anſwer our *Engliſh* Meaſure, but is neareſt the *Italian* of 5000 *Engliſh* Feet to a Mile, and 60 ſuch Miles to a Degree. But ſince it hath been found by Mr. *Norwood*, by an Obſervation made between *London* and *York*, and meaſur'd by a Chain between thoſe two Places, found it to be 69 Miles, a Half, and 14 Foot to a Degree a Degree of Latitude, therefore the ſame muſt be a Degree of Longitude on the Equator. Neither could this be true, if the Angles of the Roads were not exactly taken by an Inſtrument, and by the ſaid Angles and Diſtances, find the Difference of Latitude, and Eaſt and Weſt Meridian-Diſtances of the two Places, in the Nature of a Ship's Traverſe.

Now it is believ'd by moſt, that Mr. *Norwood*'s Computation is the beſt and trueſt that ever was made; yet, notwithſtanding all this, moſt divide the Log-Line in ſuch Proportion as before-mention'd, that 5000 *Engliſh* Feet make $\frac{1}{60}$ Part, or a Mile on the Equator: But Mr. *Norwood* makes it to be 6116 *Engliſh* Feet to $\frac{1}{60}$ Part, or a Mile, on any Meridian, or the Equator.

Now conſidering the Log-Line to be meaſur'd by a Half-Minute Glaſs, which is the $\frac{1}{120}$ Part of an Hour; divide Mr. *Norwood*'s Mile, *viz.* 6116 Feet by 120, the Quotient is almoſt 51 Feet between Knot and Knot on the Line; but if you divide the old Calculation, *viz.* 5000, by 120, the Quotient is but 41.66 Feet between Knot and Knot; but they commonly knit 42, which muſt be very falſe, or elſe the famous Mr. *Norwood* was out in his Obſervations, which could not well be, if he had good Inſtruments to take his Angles, an exact Chain to meaſure the Diſtances, and a Quadrant of a large Radius for an Obſervation.

It is by this Log-Line we govern the Current, or the Courſe of the Water thro' this Sloop, according to the Ship's Way; for, by ſo much as ſhe will run faſter or ſlower, by ſo much is the Current in the Hold faſter or ſlower.

Fig. 19.

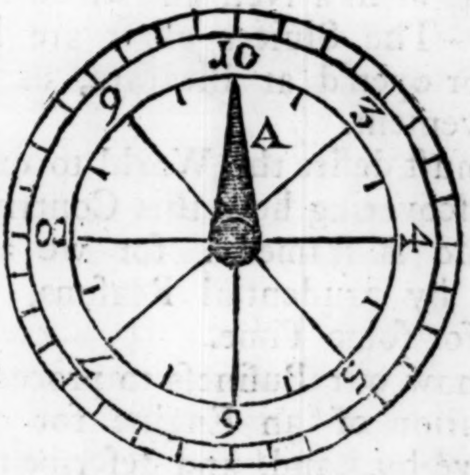


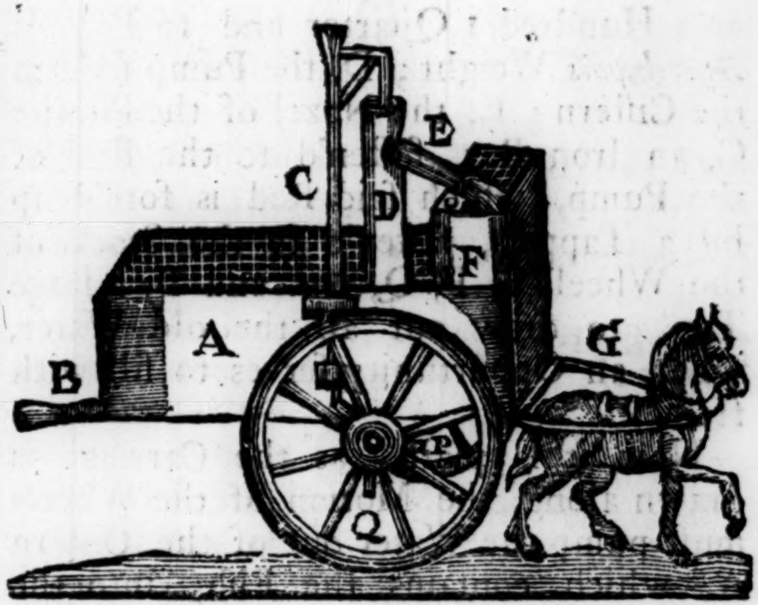
Fig. 19, repreſents a Circle divided into 8 Parts; 3, 4, 5, 6, 7, 8, 9, 10, are the Knots the Ship runs; A, the Hand, to move to thoſe Knots. This Circle is fix'd between-Decks, over the Sluices before. At 10 Knots the Sluices are quite Cloſe, and will not admit of a Gallon of Water into the Hold in ſix Hours; but move the Hand A backward from 10 to

10, the Sluices are quite open, and let in the whole Current of Water: If the Ship runs 3, 4, 5, *&c.* Knots, or $3\frac{1}{4}$, $3\frac{1}{2}$, or any of the reſt; move the Hand A to the Knots, Halves, or Quarters, it opens or ſhuts the Sluices with immediate Readineſs, and is manag'd with the ſame Eaſe as the Hand of a Clock; without which Contrivance, the Fiſh muſt have had perpetual Diſturbance, and been driven all together, as in a Net, and ſtifled for want of Air. The Sluices abaft are likewiſe cloſed or open'd at Pleaſure, as we ſhall ſee convenient.

We muſt deſire the World to excuſe us from diſcovering how this Contrivance in the Hold is framed; for we are conſtrain'd by prudential Reaſons, to conceal it for ſome Time.

It is now our Buſineſs to proceed to an Explanation of an Engine for carrying Fiſh alive by Land, and deſcribe the Contrivance of it, which we conceive to be as well ſupported by Reaſon and the Laws of Mechaniſm, as that for the Conveyance of Fiſh by Sea.

The



The Deſcription *of a Carriage to convey Fiſh alive to any Part by Land, keeping a conſtant Current of Water thro' it.*

A, the Ciſtern to hold the Fiſh, being 4 Foot 6 Inches long, 2 Foot 9 Inches broad, and the whole Depth 2 Foot 3 Inches, but in Water 1 Foot 6 Inches. It will hold 138.8 Gallons, Weight 1160 Pounds, or 10 Hundred 1 Quarter and 12 Pounds *Averdupois* Weight; F, the Fountain to ſupply the Ciſtern with Water, as faſt as it is pump'd up by the Wheel of the Carriage, being 2 Foot 9 Inches long, 1 Foot 3 Inches broad, and 1 Foot 3 Inches deep, meaſures 32.14 Gallons, Wine Meaſure, Weight 268 Pounds, or 2 Hundred 1 Quarter and 16 Pounds *Averdupois* Weight; D, the Pump fix'd in the Ciſtern; E, the Nozel of the Pump; C, an Iron Bar, faſten'd to the Rod of the Pump, which ſaid Rod is forc'd up by 3 Tappets, faſten'd to the Stock of the Wheel, as P, Q, *&c.* and B, a large Tap, to draw out all the old Water, when an Opportunity ſerves to fill with freſh.

Now it is plain, as the Carriage is drawn along, the Motion of the Wheels muſt pump the Water out of the Ciſtern A, which contains the Fiſh, into the Fountain F, which; by ſo much as the ſaid Fountain is higher than the Ciſtern, by ſo much the Weight of Water muſt preſs thro' the ſmall Holes out of the Bottom of the Fountain F, into the Ciſtern A, which muſt of Neceſſity keep the Water always in Motion, to the Relief of the Fiſh; but at all Opportunities on the Road, we ſhall draw out, at the Tap B, all the ſtale Water, and fill the Fountain and Ciſtern with freſh River or running Water. This Carriage hath been prov'd by a Carriage made in the like Form, wherein was put ſmall Fiſhes, and kept there ſeven Weeks; but when we ſtopp'd the Current for ſome Time, we found them to grow ſick, and one or two die; but when the Water was put in Motion, we could perceive thoſe ſtill living to revive and grow briſk. By this we concluded, that according to the Number of Fiſhes in the Carriage, the Water would ſooner or later corrupt; which likewiſe proves our Aſſertion in the *Fiſh-Pool* Sloop.

We have gone through the Illuſtration and Proof of our Deſign, as to the Reaſonableneſs of it; it remains only that we ſay ſomething concerning its Uſefulneſs; upon which Subject, it is neither graceful or neceſſary to ſay much, but the Thing ſpeaks itſelf; and when we conſider what Injury is receiv'd by tormenting Land-Animals, and how the Corruption of their Bodies is haſten'd by chaſing and driving them, we may eaſily conceive, that the miſerable and painful Way, in which Fiſh, for a much longer Time, is convey'd in *Well-Boats*, muſt have ſuitable unhealthy Effects: That ſo delicious a Food as that of Sea-Animals, brought alive and in Health to our very Kitchins, wherever we reſide, cannot but be as welcome and beneficial to all Mankind, as well as fortunate to the Undertakers, as any Invention that has been brought into Practice for many Ages.

Neither can this Deſign have any ill Conſequences upon the FISHING TRADE in general; ſince all Men, upon very eaſy

Terms, may be admitted into the Uſe of this Machine, in ſuch a Manner, as that the Perſons already engag'd in it, may have no Reaſon to complain, and all the reſt of the World have very great and unexpected Benefit by it.

The lowering the Price of Fiſh will abundantly make up to the Sellers of it, by the much greater Number of Purchaſers; and if a Man gets ten Pound by ſelling what coſt him five, to twenty People, he will be in a better Condition, than when he made ſeven Pounds of five, by ſelling the Commodity which coſt him that Sum, to fifteen, ten, or five Perſons: For it is certain, that when a better Commodity can be had for a lower Price, the Number of new Purchaſers will more than make up for the Abatement of the Price formerly given by a few.

But notwithſtanding the plain Proof of the Reaſonableneſs of this Deſign, which has been here made in Theory, and the Practice of it in little Experiments; we muſt not expect the World will be fully convinc'd of the Truth and Uſefulneſs of it, 'till we have actually preſented them with Fiſh imported in great Quantities this Way: But we thought it incumbent upon us to explain our ſelves, before we expos'd Men to the Hazard of the Seas on ſo new a Projection: For ſhould it ſo happen, (which God forbid) that this Veſſel ſhould come to any Diſaſter in Circumſtances, which would be equally dangerous to any Veſſel of the ordinary Structure; it would be attributed to the Novelty of her Make, and never acknowledg'd, that any other Ship in that Situation would have equally ſuffer'd.

But it is Time to fear, that we are falling into the natural Infirmity of being too fond of our own Productions; we therefore (begging Leave to annex the Patent, which his Majeſty has been graciouſly pleas'd to give for the Uſe of this Invention for the ordinary Term in ſuch Caſes) ſubmit the whole Matter, with great Humility, to the Conſideration of the Publick.

GEORGE R.

GEORGE, by the Grace of God, *&c.* To all to whom theſe Preſents ſhall come, Greeting.

WHEREAS our truſty and well-beloved Subject, Sir *Richard Steele,* Kt. hath, by his Petition, humbly repreſented unto us, that he has for ſome Years laſt paſt, turn'd the Intention and Bent of his Thoughts and Studies to the Good and Service of the Publick; and that he has, from much Search, Enquiry, and Converſation, among ſundry Artiſts, Artificers, and Perſons of Learning, at great Expence, invented a certain Veſſel, which, by the Structure thereof, can bring Fiſh, where-ever caught, to any diſtant Place, alive and in Health; which will greatly contribute to the general Good of all our Subjects; humbly praying us to grant him our Royal Letters Patents, for the ſole Uſe and Benefit of his ſaid Invention for the Space of fourteen Years. *Know ye,* That We, (being willing to give Encouragement to all Arts and Inventions that may be of publick Uſe and Benefit) of our eſpecial Grace, certain Knowledge, and meer Motion, have given and granted, and by theſe Preſents, for Us, our Heirs, and Succeſſors, do give and grant unto the ſaid Sir *Richard Steele,* his Executors, Adminiſtrators, and Aſſigns, eſpecial Licenſe, full Power, ſole Privilege and Authority, that He the ſaid Sir *Richard Steele,* his Executors, Adminiſtrators, and Aſſigns, and every of them, by himſelf or themſelves, or by his or their Deputy or Deputies, Servants or Agents, or ſuch others as he the ſaid Sir *Richard Steele,* his Executors, Adminiſtrators, or Aſſigns, ſhall at any Time agree with, and no others, from Time to Time, and at all Times hereafter, during the ſaid Term of fourteen Years, ſhall and lawfully may exerciſe, work, uſe, and enjoy, the ſaid new Invention of making and uſing ſuch Veſſel or Veſſels aforeſaid, which, by the Structure thereof, can bring Fiſh, wherever caught, to any diſtant Place alive and in Health, in ſuch Manner as to him the ſaid Sir *Richard Steele*, his Executors, Adminiſtrators, and Aſſigns, or any of them, ſhall in their Diſcretions ſeem meet: And that he the ſaid Sir *Richard Steele*, his Executors, Adminiſtrators, and Aſſigns, ſhall and may have and enjoy the whole Profit, Benefit, Commodity, and Advantage, from Time to Time coming, growing, accruing, and ſo ariſing, by Reaſon of the ſaid Invention; to have, hold, exerciſe, and enjoy the ſaid Licenſe, Powers, Privileges, and Advantages herein before-mention'd, to be hereby granted unto the ſaid Sir *Richard Steele*, his Executors, Adminiſtrators, and Aſſigns, for and during and unto the full End and Term of fourteen Years from the Date of theſe Preſents, next and immediately enſuing, and fully to be compleat and ended, according to the Statute in that Caſe made and provided. And to the Intent that the ſaid Sir *Richard Steele*, his Executors, Adminiſtrators, and Aſſigns, and every of them, may have and enjoy the full Benefit and Advantage, and the ſole Uſe and Exerciſe of the ſaid Invention, according to our gracious Intention herein before declar'd, We do, by theſe Preſents, for Us, our Heirs, and Succeſſors, require and ſtrictly command all and every Perſon and Perſons, Bodies politick and corporate, and all other our Subjects whatſoever, of what Eſtate, Quality, Degree, Name, or Condition ſoever they be, within that Part of our ſaid Kingdom of *Great Britain* call'd *England*, our

Dominion of *Wales*, and Town of *Berwick upon Tweed*, that neither they or any of them, at any Time, during the ſaid Term of fourteen Years, either directly or indirectly, do make, uſe, exerciſe, or put in Practice, the ſaid Invention, or any Part of the ſame, ſo attain'd unto by the ſaid Sir *Richard Steele*, as aforeſaid; or ſhall in any wiſe counterfeit, imitate, or reſemble the ſame; nor ſhall make or cauſe to be made any Addition thereto, or Subſtraction from the ſame, whereby to pretend himſelf or themſelves the Inventor or Inventors, Deviſor or Deviſors thereof, without the Licenſe, Conſent, or Agreement of the ſaid Sir *Richard Steele*, his Executors, Adminiſtrators, or Aſſigns, in Writing under his or their Hands and Seals firſt had and obtain'd in that Behalf, upon ſuch Pains and Penalties as can or may be juſtly inflicted on ſuch Offenders, for their Contempt of this Our Royal Command; and farther, to be anſwerable unto the ſaid Sir *Richard Steele*, his Executors, Adminiſtrators, and Aſſigns, according to Law, for all Damages which he or they ſhall or may ſuſtain thereby. And moreover, we do by theſe Preſents, for Us, our Heirs, and Succeſſors, will and command all and ſingular our Juſtices of the Peace, Mayors, Sheriffs, Bailiffs, Conſtables, Headboroughs, and all other Officers and Miniſters whatſoever, of Us, our Heirs, and Succeſſors, for the Time being, that they or any of them do not or ſhall not at any Time hereafter, during the ſaid Term hereby granted, in any wiſe moleſt, trouble, or hinder the ſaid Sir *Richard Steele*, his Executors, Adminiſtrators, or Aſſigns, or any of them, or his, their, or any of their Deputies, Servants, or Agents, in or about the Exerciſe of the ſaid Invention, or any thing relating thereunto. *Pro-*

vided always, and theſe our Letters Patents are and ſhall be upon this Condition, That if at any Time during the ſaid Term hereby granted, it ſhall be made appear to Us, our Heirs, or Succeſſors, or any ſix or more of our or their Privy-Council, that this our Grant is contrary to Law, or prejudicial or inconvenient to our Subjects in general; or that the ſaid Invention is not a new Invention, as to the publick Uſe and Exerciſe thereof, within that Part of our ſaid Kingdom of *Great Britain* call'd *England*, our Dominion of *Wales*, and Town of *Berwick* upon *Tweed*, or not invented and found out by the ſaid Sir *Richard Steele*, as aforeſaid; Then, upon Signification and Declaration thereof, to be made by Us, our Heirs, or Succeſſors, under our or their Signet or Privy-Seal, or by the Lords and others of our or their Privy-Council, or any ſix or more of them, under their Hands; theſe our Letters Patents ſhall forthwith ceaſe, determine, and be utterly void to all Intents and Purpoſes, anything herein before contain'd to the contrary in any wiſe notwithſtanding. *Provided alſo*, That theſe our Letters Patents, or anything herein contain'd, ſhall not extend or be conſtrued to extend to give Privilege to the ſaid Sir *Richard Steele*, his Executors, Adminiſtrators, or Aſſigns, or any of them, to uſe, or imitate, any Invention or Work whatſoever, which hath heretofore been found out, or invented, by any other of our Subjects whatſoever, and publickly uſed or enjoy'd within that Part of our Kingdom of *Great Britain* call'd *England*, our Dominion of *Wales*, and Town of *Berwick upon Tweed*, unto whom like Letters Patents, or Privileges have been already granted, as aforeſaid; Our Royal Will and Pleaſure being, that ſuch other our Subjects, and the ſaid Sir *Richard Steele*, his Executors, Adminiſtrators,

tors, and Aſſigns, ſhall diſtinctly uſe and practiſe their ſeveral Inventions, by them invented and found out, according to the true Intent and Meaning of the ſame reſpective Letters-Patents, and of theſe Preſents. *And laſtly*, We do, by theſe Preſents, for Us, our Heirs, and Succeſſors, grant unto the ſaid Sir *Richard Steele*, his Executors, Adminiſtrators, and Aſſigns, that theſe our Letters Patents, or the Enrollment thereof, ſhall be in and by all Things good, firm, valid, and effectual in the Law; and ſhall be taken, conſtru'd, and adjudg'd in the moſt favourable and beneficial Senſe, and for the beſt Advantage of the ſaid Sir *Richard Steele*, his Executors, Adminiſtrators, and Aſſigns, as well in all Courts of Record, as elſewhere, and by all and ſingular the Officers and Miniſters whatſoever, of Us, our Heirs, and Succeſſors, within that Part of our ſaid Kingdom of *Great Britain* call'd *England*, our Dominion of *Wales*, and Town of *Berwick upon Tweed*, and amongſt all and every the Subjects of Us, our Heirs, and Succeſſors whatſoever and whereſoever; notwithſtanding the not full and certain deſcribing the Nature and Quality of the ſaid Invention, or of the Materials thereto conducing and belonging. *In Witneſs, &c.*

Witneſs, &c.

FINIS.

ERRATA.

Page 16, Line 25, inſtead of 62.75, read 62.5; Page 21, Line 26, inſtead of 982, read 966.5.